

WHAT IS CLAIMED IS:

- 1 1. A method for reducing drift in an artificial olfaction device having
2 an array of sensors, said method comprising:
3 contacting said array of sensor with an analyte at a first temperature to
4 produce a first response;
5 contacting said array of sensor with said analyte at a second temperature to
6 produce a second response; and
7 subtracting the first response from the second response thereby reducing
8 drift in said sensor array.
- 1 2. The method of claim 1, wherein at least one sensor in said array of
2 sensors is selected from the group consisting of a conducting and nonconducting regions
3 sensor, a SAW sensor, a quartz microbalance sensor, a conductive composite sensor, a
4 chemiresistor, a metal oxide gas sensor, an organic gas sensor, a MOSFET, a piezoelectric
5 device, an infrared sensor, a sintered metal oxide sensor, a Pd-gate MOSFET, a metal
6 FET structure, a electrochemical cell, a conducting polymer sensor, a catalytic gas sensor,
7 an organic semiconducting gas sensor, a fiber optical chemical sensor, a solid electrolyte
8 gas sensors, and a piezoelectric quartz crystal sensor.
- 1 3. The method of claim 2, wherein at least one sensor is a conducting
2 and nonconducting regions sensor.
- 1 4. The method of claim 2, wherein at least one sensor is a SAW
2 sensor.
- 1 5. The method of claim 1, wherein said analyte and said sensor array
2 are equilibrated at said first temperature.
- 1 6. The method of claim 1, wherein said analyte and said sensor array
2 are equilibrated at said second temperature.
- 1 7. The method of claim 1, wherein the difference between said first
2 temperature and said second temperature is between about 5°C and about 150°C.
- 1 8. The method of claim 7, wherein the difference between said first
2 temperature and said second temperature is between about 2°C to about 70°C.

1 9. The method of claim 1, wherein said artificial olfaction device
2 comprises two arrays of sensors.

1 10. The method of claim 1, wherein said artificial olfaction device is a
2 handheld device.

1 11. A sensor module configured for external mounting on a sensing
2 apparatus for detecting an analyte in a fluid, said sensor module comprising:
3 a casing sized and configured to be received in a receptacle of the sensing
4 apparatus;
5 at least two sensor to provide a distinct response when exposed to one or
6 more analytes; and
7 an electrical connector configured to be releasably engageable with a
8 mating electrical connector of the sensing apparatus when the sensor module is received
9 in the receptacle, said electrical connector transmitting the characteristic signals from the
10 at least two sensors to the sensing apparatus.

1 12. The sensor module of claim 11, wherein said sensor module
2 comprises a memory device.

1 13. The sensor module of claim 11, wherein at least one sensor in said
2 array of sensors is selected from the group consisting of a conducting and nonconducting
3 regions sensor, a SAW sensor, a quartz microbalance sensor, a conductive composite
4 sensor, a chemiresistor, a metal oxide gas sensor, an organic gas sensor, a MOSFET, a
5 piezoelectric device, an infrared sensor, a sintered metal oxide sensor, a Pd-gate
6 MOSFET, a metal FET structure, an electrochemical cell, a conducting polymer sensor, a
7 catalytic gas sensor, an organic semiconducting gas sensor, fiber optical chemical sensor,
8 a solid electrolyte gas sensors, and a piezoelectric quartz crystal sensor.

1 14. The sensor module of claim 13, wherein at least one sensor is a
2 conducting and nonconducting regions sensor.

1 15. The sensor module of claim 13, wherein at least one sensor is a
2 SAW sensor.

1 **16.** The sensor module of claim **11**, wherein said sensing apparatus is a
2 handheld device.

1 **17.** A sensing device for detecting an analyte, said device comprising:
2 a housing;
3 a sensor module mounted externally on said housing and incorporating an
4 array of sensors, each of said sensors providing a different response in the presence of
5 said analyte;
6 a monitoring device mounted on said housing and configured to monitor
7 said responses of the array of sensors incorporated in the sensor module, and further
8 configured to produce a plurality of sensor signals; and
9 an analyzer mounted on said housing and configured to analyze said
10 plurality of sensor signals to identify said analyte.

1 **18.** The sensor device according to claim **17**, wherein said sensor
2 module is capable of automatic physical movement.

1 **19.** The sensor device according to claim **17**, wherein said sensor
2 module comprises at least two pneumatic vapor paths and at least two sensor arrays.

1 **20.** The sensor device according to claim **17**, wherein said response is a
2 member selected from the groups consisting of resistance, impedance, mechanical
3 capacitance, inductance, frequency, magnetic and optical.

1 **21.** The sensor device according to claim **17**, wherein at least one
2 sensor is selected from the group consisting of inorganic metal oxide semiconductors,
3 intrinsically conducting polymers, mass sensitive piezoelectric sensors, surface acoustic
4 wave sensors and nonconducting and conducting regions sensors.

1 **22.** The sensor device according to claim **17**, wherein said analyzer
2 comprises a comparison algorithm wherein said comparison is performed using a pattern
3 recognition algorithm which is a member selected from the group consisting of principal
4 component analysis, Fisher linear discriminant analysis, soft independent modeling of
5 class analogy, K-nearest neighbors, and canonical discriminant analysis.

1 **23.** A sensing device for detecting an analyte in a fluid, said device
2 comprising:
3 a first sensor element having a first sensor array for producing a response
4 in the presence of said analyte;
5 a second sensing element having a second sensor array for referencing said
6 system;
7 a computer coupled to said first and said second sensing elements having a
8 resident algorithm.

1 **24.** The sensing device according to claim **23**, wherein said first
2 sensing element is physically located distinctly from said second sensing element.

1 **25.** The sensing device according to claim **24**, wherein said second
2 sensing element has attached thereto a pasivation layer.

1 **26.** The sensing device according to claim **25**, wherein said pasivation
2 layer comprises a material that is a member selected from the group consisting of SiO₂
3 and SiO₂ based films.

1 **27.** The sensing device according to claim **26**, wherein said SiO₂ based
2 film is a member selected from the group consisting of thermal oxides, silane, SiH₄,
3 tetraethoxysilane, Si(OC₂H₅)₄, silicate glasses, and spin on glass.

1 **28.** The sensing device according to claim **24**, wherein said first
2 sensing element is in a first sample chamber and said second sensing element is in a
3 second sample chamber.

1 **29.** The sensing device according to claim **24**, wherein said second
2 sensing element has attached thereto a porous membrane layer.

1 **30.** The sensing device according to claim **29**, wherein said porous
2 membrane layer limits diffusion of said analyte.

1 **31.** The sensing device according to claim **24**, wherein said second
2 sensing element is a reference element and sensing element is temperature controlled.

1 **32.** A method for mapping an x-y surface for detection of an analyte,
2 said method comprising:
3 moving in tandem at least two sensor arrays separated by a distance “d”
4 across an x-y surface to produce a plurality of responses; and
5 analyzing said responses and thereby mapping the x-y surface for detection
6 of said analyte.

1 **33.** A parallel independent sensor array device for detecting a plurality
2 of test samples independently and simultaneously, said parallel independent sensor array
3 device comprising:
4 a parallel matrix of sensors to produce a plurality of responses each of said
5 plurality of responses generated from a corresponding plurality of test samples; and
6 an electrical measuring apparatus to simultaneously detect each of said
7 plurality of responses.

1 **34.** The device of claim **33**, further comprising a computer coupled to
2 each of said sensors having a resident algorithm.

1 **35.** The device of claim **33**, wherein each of said plurality of responses
2 is generated from a member selected from the group consisting of antibiotics, catalysts,
3 drugs, biomolecule binding efficiencies, nucleic acid hybridizations, ligand-ligand
4 interactions, biomolecule interactions, and drug candidates.